

RESPONSE TO MDEQ NOVEMBER 25, 2014 COMMENTS ON THE SEPTEMBER 19 AREA-WIDE NON-PCB SCREENING DOCUMENT

The Michigan Department of Environmental Quality (MDEQ) has concluded its review of the Draft Area-Wide Non-PCB (Polychlorinated Biphenyl) Constituent Screening Evaluation. The MDEQ agrees with the U.S. Environmental Protection Agency's (U.S. EPA's) November 14 comments on, and disapproval of the September 19, 2014 Report. In addition to the issues raised in the U.S. EPA's comments, we are offering additional comments specific to dioxin-like compounds (DLCs). AMEC has spent considerable effort in attempting to show that paper mills are not likely sources of dioxins/furans to the river; however, it appears that many of the approaches being relied upon are simply not supported by the analysis, and this effort distracts from the goals of the screening exercise.

All preliminary and historical evaluations (e.g., CDM, 2001) demonstrate that PCBs will be the primary risk driver at the Kalamazoo site. DLCs are dominated (>80%) by co-planer PCBs. Cleaning up PCBs in sediments and in the floodplain is fully expected to control the risks from non-PCB Chemicals of Concern (COCs). Some additional sampling of soils and sediments may be needed to provide definitive confirmation of the expected relationships. The screening document needs to carry forth the appropriate Chemicals of Interest (COIs)/COCs until risk assessment work demonstrates that DLCs can be dropped from consideration.

The primary goal with the non-PCB screening analysis is to document and demonstrate which COC(s) are the main risk drivers at the site (which we anticipate to be PCBs), the extent to which dioxins/furans are co-located with PCBs, and the risk contributions from both DLCs and non-PCB DLCs as compared to just Aroclors. The September 19, 2014, document has not fully developed the proper approaches to achieve these goals. The U.S. EPA's suggestions provide the proper direction and should result in an approach the MDEQ is supportive of.

Response: *The Area-Wide Non-PCB Screening document indicated that dioxins and furans were constituents of concern (COIs) and that they would be carried forward in a subsequent risk evaluation. The document did not state that paper mill residuals were unlikely sources of dioxins/furans. Rather, dioxin/furans are documented as detected in the paper residual samples. Other sources of dioxins/furans are also noted because it is likely that sources, other than paper residuals, contribute some level of dioxins/furans to sediment and soil in Operable Unit 5 (OU-5).*

A scope of work and purpose of the document was submitted to both USEPA and MDEQ prior to the commencement of this work. A work group representing USEPA, MDEQ, and GP convened and agreed upon this scope of work. The purpose of the draft September 19, 2014 Area-Wide Non-PCB Screening document was to identify non-PCB COIs. The initial purpose was not to perform a collocation study or to compare non-PCB results with PCBs. A subsequent revision, submitted on January 30, 2015, included collocation mapping of dioxins/furans results with the remedial footprint for Areas 1, 2, and 3. Additional sampling is not necessary for these Areas. The document, as approved by USEPA on March 4, 2015, concluded that risk management and remedial decisions based on total PCBs would also address dioxin/furans.

A separate technical memorandum that addresses dioxin-like PCBs will be submitted to USEPA and MDEQ subsequent to the Area-Wide Non-PCB Screening document. Dioxin-like PCBs were not addressed in the non-PCB screening document to focus the reader on non-PCB constituents. This memorandum concludes that risk management and remedial decisions based on total PCBs would also address both dioxin/furans and dioxin-like PCBs.

Georgia-Pacific and Amec Foster Wheeler believe that the September 19, 2014 non-PCB screening document met the goals initially agreed upon. After further discussion with USEPA and MDEQ, collocation mapping with remedial footprints and a comparison of non-PCB hazard quotients for COIs to that for total PCBs were included, rather than submitting this information in a subsequent document, as initially planned.

Key issues for consideration in rewriting the document and/or potential future discussions

While it appears very clear that PCBs are the risk driver, the analyses used to assess dioxins/furans in the Kalamazoo River system cannot be used to support conclusions that sources other than mill processes were significant contributors to 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD) dioxin toxicity equivalence (TEQ) in soils and sediments. Literature and statements from the document actually support the conclusion that the dioxins/furans found in soils and sediments are from paper residuals and/or processes used by former Kalamazoo paper mills. Further, furans are known constituents of commercial PCBs (Kimbrough 1989).

The limitations in the analyses are discussed briefly below.

- 1) The document assumes that datasets are representative of both reference and site contamination without supporting analysis. Basically, the report indicates that reference data were taken from locations that may not be heavily influenced by mixing with soil and/or sediments. This conclusion has not been demonstrated. Because much of the river is unsampled, available data cannot be demonstrated to be generally representative.
- 2) A so-called dilution argument, or lack of dilution, has been applied in an attempt to draw an unsupportable conclusion that dioxins/furans found in soils or sediments, must be statistically lower than found in paper residuals. Otherwise, it demonstrates that there is ambient background or other source contributions. The approach is not technically sound. First, because there is wide variance in the dioxin residual and soil data, it would be difficult to show statistical differences. A large amount of the soil and sediment data adjacent to locations where paper residuals would be deposited is part of the database. Therefore, it would be expected that the concentrations of dioxins in soils and sediments would overlap with those found in paper residuals.
- 3) Simple two-sample statistical tests are used in an attempt to support the hypothesis that no dilution has occurred following release of paper mill wastes to the river system. Such tests are inadequate for this purpose. Entire data sets must be evaluated to obtain a clear understanding of what data actually show.

Response to Items 1 through 3 regarding comparison of paper residuals to soil/sediment:

The non-PCB constituent results from landfilled paper residuals do not indicate a substantial degree of mixing with soil. Sediment is not expected to be present within the landfilled materials. Analytical data collected in cores from paper residuals wastes were designated as "residual" or "soil". Samples analyzed for non-PCB constituents were clearly associated with higher concentrations of total PCBs indicating they were located within the paper residuals and not mixed with soil. Lower depth samples that indicated the presence of soil were not used in this evaluation. Total PCB concentrations in paper residuals were compiled for subsamples collected from 50 percent to 90 percent of the overall vertical sampling depth profile (presented in Appendix A, Table A-10). The focused interval of 50 to 90 percent of the vertical depth profile was selected to verify that the constituents potentially associated with paper residuals were accurately identified and did not include fill material from grading activities above the paper residuals or the native soil below the paper residuals. Concentrations of PCBs were compared across sample intervals for each core. PCB concentrations are elevated and consistent (relative to fill at shallow depths and native soil at depth) in samples collected from the middle to lower intervals of the paper residuals waste material. In addition to the sample designation, the higher PCB concentrations provides evidence that non-PCB samples were taken from paper residuals waste and not mixed with native, base, or cover soils.

Sample size for each constituent was appropriate for the statistical test utilized, based on current USEPA guidance (ProUCL Version 5.0.00 Technical Guide, USEPA, 2013). Constituent sample size (n) ranged from 8 to 172, with most having more than 50 samples. This sample size was acceptable for statistical analysis, particularly for non-parametric tests such as those used to conduct two-sample hypothesis testing. The results of the statistical test were qualified by the number of samples available.

Two-sample hypothesis testing is a simple test for comparing the mean/median of two samples. USEPA recommended statistical comparison of paper residuals to the media to qualitatively compare potential source and receiving media concentrations. Two-sample hypothesis statistical testing was used for comparison of soil and sediment concentrations of COIs to paper residuals concentrations as a qualitative step, not as an elimination step for COIs in the revised January 30, 2015 document, as requested by USEPA. The two-sample hypothesis testing is weighted heavily in qualifying the importance of carrying a specific COI forward for further evaluation. This statistical technique allows for parametric and non-parametric distributions. The datasets were tested for normality, but most COIs did not have normally distributed data, resulting in the use of non-parametric two-sample hypothesis tests such as the Wilcoxon-Mann-

Whitney and Gehan tests. With small datasets such as that for TCDD TEQ, these statistical tests are valid and appropriate. Therefore, the statistical tests were performed using standard statistical methods with transparency as to the data used and are appropriately reported.

- 4) A discussion of dioxins/furans in the Kalamazoo River system and potential other sources requires that a dioxin fingerprint (congener analysis) comparing paper residuals with soil and sediment data (and paper residual data cited in the 2001 CDM report, if not included) be conducted. As discussed below, dioxins/furans found in residuals, soils, and sediments at the site are consistent with those found from studies of recycling paper mills.

Section 2.4.3 - Sources of Dioxins/Furans. As written, this section is not acceptable for several reasons noted below. It is recommended that the discussion on sources of dioxins/furans be eliminated from the document. If the source discussion is included, it should be limited to a supportable analysis.

Response: *Sources of dioxins/furans, other than paper residuals, are germane, and are discussed consistent with the other non-PCB constituents, such as metals, pesticides, and semi-volatile organic compounds. Many of these potential sources exist in the region surrounding the Kalamazoo River and are likely contributors to the total dioxin/furan inventory. Many dioxin/furan sources share similar fingerprints to that of paper residuals, and after mixing in a riverine environment, may not be readily distinguishable. In addition, the heavier congeners (e.g., heptaCDD) do not degrade as readily as the lighter congeners (e.g., tetraCDD) and are more persistent and may be over-represented in the resulting fingerprints relative to original sources. Homogeneity of the heavier compounds due to multiple sources and recalcitrance to degradation makes fingerprinting difficult and degradation of the lighter congeners may lead to mis-identification of sources. Therefore, fingerprint evaluation was not conducted and was not part of the agreed upon scope of work with USEPA and MDEQ.*

- a. Generic discussion of regional and national sources of dioxins is not germane to the issue of sources of DLCs in the Kalamazoo River. No arguments for the existence of significant alternate local sources have been made to support the elimination of DLCs from consideration.

Response: *The focus of this document is non-PCB constituents. DLCs (dioxin-like compounds) are PCB and were not addressed in this document.*

- b. Generic discussion of sources ignores the need to examine congener profiles.

Response: *See Response to Item 4.*

- c. Although other national dioxin/furan sources are mentioned, no information has been provided on primary and secondary fiber paper mills. Dioxins/furans, similar in profile to

those found in Kalamazoo paper residuals, have been well documented in discharges from paper mills using chlorine, sulfites, other oxidative processes (e.g., peroxides) in wastewater treatment, recycling paper with dioxins/furans, and on-site combustion of paper wastes. Additional data on dioxin formation are also available from: Preliminary Report: Pulp, Paper, and Paperboard Detailed Study, EPA-821-B-05-007, 2007.

Data collected by the U.S. EPA or provided to the U.S. EPA by industry on secondary fiber mills indicated detectable levels of TCDD in the effluents of 2 of 12 mills with reported monitoring data and detectable levels of 2,3,7,8-tetrachlorinated dibenzofuran (TCDF) in the effluents of 4 of the 7 mills with data (U.S. EPA, 1993). Both Berry (1993) and Rappe (1990) concluded that their results indicated that paper and paperboard products during their life cycle can accumulate dioxins/furans.

Response: *The above references have been added to the document.*

- 5) To properly discuss background levels of dioxins/furans, the document needs to recognize and discuss the University of Michigan (U of M) Dioxin Exposure Study (UMDES 2005). This study reports extensive dioxin/furan soil data, and was provided to AMEC but was not included in discussion of background dioxin data. Congener specific raw data are readily available with statistical distribution at the U of M web site:

http://www.sph.umich.edu/dioxin/PDF/BDS_new_region_forwebsite/BDS_2005_29/Soil_2005_29.pdf

This information is particularly relevant as Jackson and Calhoun counties were heavily sampled and include data representative of background soil levels in the Kalamazoo region, including those from urban locations.

Urban data from Seattle are discussed in the report, but seem irrelevant to the Kalamazoo River. The argument that ambient "levels not attributable to a specific point source and can be much higher than 10 ng/kg [nanograms per kilogram] and even greater than 100 ng/kg" is misleading because it has no connection with conditions at the site. The issue is not to find values among the highest reported from urban areas and then assume that such values are common in a different area. The Seattle data must be removed from the document.

Response: *Amec Foster Wheeler is not in receipt of an extensive database from MDEQ. Amec Foster Wheeler contacted MDEQ's technical expert on dioxins/furans to request these data. The data provided in a September 9, 2014 email to Amec Foster Wheeler in pdf form as part of the University of Michigan Dioxin Exposure Study was presented as descriptive statistics by PCB DLC congener and for dioxins/furans. Amec Foster Wheeler accessed the website, but raw data were not available for individual samples. The data appear to be "grayed out" on the website and are not visible. No total TCDD TEQ was presented, but rather a TEQ for both DLCs and TCDD congeners. It would not be appropriate to provide average background data from one study and compare that to individual sample results in the floodplain of the Kalamazoo River. Therefore, the population statistics from several studies, as available, were included and will remain in the document for informational purposes. The TCDD TEQ information for*

Jackson/Calhoun Counties has been added to the document. Discussion of background levels of dioxins/furans is used as a comparison step, not an elimination step in the screening evaluation.

- 6) Until additional data and risk analysis are available, dioxins/furans will need to be retained as COI/COCs based upon levels found to date in the floodplain soils and river sediment. TCDD TEQ levels above the MDEQ's residential criteria of 90 parts per trillion (ppt) will exceed a TEQ Hazard Index (HI) of one and a 10^5 cancer risk. COIs/COCs are retained in Superfund risk assessments and remedial evaluation when HI/Hazard Quotients (HQs) are greater than 1. For screening, the value used in the report (10) is not appropriate and COI should be retained for an HI of greater than 1. In addition, when addressing risks and hazards from dioxins/furans, their incremental contribution to DLC-PCBs impacts must be evaluated.

Response: *Dioxins/furans were retained as COIs for further evaluation. A seventh step in the screening process was added to evaluate risk comparatively between COIs and total PCBs. This step does not eliminate COIs, but provides a comparison of COI HQs to the Total PCBs HQ. Step 7 identifies non-PCB constituents which indicate the potential for less risk than that associated with total PCBs. Therefore, non-PCB constituents showing a lower potential risk relative to total PCBs (lower HQs) were not carried forward for further evaluation. Non-PCB constituents that indicate a potential for risk greater than total PCBs were further evaluated by collocation mapping with the total PCB remedial footprint.*

Because the data collection efforts were highly biased, a HQ of 10 was initially used. The report was revised to include a HQ of 10 or greater to represent a primary COI because there is reasonable certainty that the constituent is a COI, even with the biased data collection. A COI was considered secondary if the HQ was between 1 and 10 with less certainty that the constituent is truly a COI.

- 7) Include site-related TEQ data from the CDM 2001 document, "Summary of Dioxin Data for Allied Paper/Portage Creek Kalamazoo River Superfund Site." This document presents average TCDD TEQ levels, without DLC-PCBs, in paper residuals from several locations where paper residuals had been disposed or accumulated.

Response: *Three samples were added for TCDD TEQ in the paper residuals dataset. Duplicate samples were not included. The other samples were already included.*

- 8) Mean dioxin TEQs in the Area 2 floodplain (without including DLC-PCBs) were reported to be 238 ppt, exceeding the MDEQ's 90 ppt residential risk-based criteria, as acknowledged in the Area 2 Supplemental Remedial Investigation Report. Background, congener based, soil studies conducted by the University of Michigan in Jackson and Calhoun counties revealed dioxin TEQ mean soil levels of 10 ppt or less. Sediments were found to have dioxin TEQs up to an order of magnitude above background and will need to be included in the evaluation.

Response: *Comment noted. Dioxin/furan background data for sediment were not available.*

- 9) Note that paragraphs in the report, such as those below, need to be deleted and, if the current scope of the report is retained, replaced with appropriate text:

pg. 2-15 "The range of soil concentrations (0.042 ng/kg to 1071 ng/kg) overlaps the range of paper residual concentrations (0.989 ng/kg to 682 ng/kg; Table 2-5)...."

pg. 3-10 "TCDD TEQ – The range of sediment concentrations (0.00054 ng TEQ/kg to 29.64 ng TEQ/kg) falls below the range of paper residual concentrations (0.989 ng TEQ/kg to 682 ng TEQ/kg; Table 2-5)...."

Response: *The above statements are summaries of the range of concentrations and are simple side-by-side comparisons of the ranges of each constituent in the given media. Additional information used in evaluating the data are provided in Tables 2-14 for soil and 3-13 for sediment, including the mean, median, standard deviation, and sample size. The summaries of the data were retained in the document. The comparisons are qualitative and are not used to eliminate dioxins/furans as a COI.*

References

U.S. EPA/Paper Industry Cooperative Study: The 104 mill study. EPA. 1990.

U.S. EPA, Preliminary Report: Pulp, Paper, and Paperboard Detailed Study. EPA-821-B-05-007. 2007.

U.S. EPA. Development document for proposed effluent limitations guidelines and standards for the pulp, paper and paperboard point source category. Washington, DC: Office of Water. EPA-821-R-93-019. 1993.

University of Michigan Dioxin Exposure Study (UMDES 2005).

Berry, R.M.; Lutke, C.E.; Voss, R.H. Ubiquitous nature of dioxins: a comparison of the dioxins content of common everyday materials with that of pulps and papers. Environ. Sci. Technol. 27(6):1164-1168. 1993.

Kimbrough, R.D.; A.A. Jensen. Halogenated biphenyls, terphenyls, naphthalenes, dibenzodioxins and related products, 2nd Edition, 15-20. 1989.

Rappe, C.; Glas, B.; Kjeller, L.O.; Kulp, S.E. Levels of PCDDs and PCDFs in products and effluent from the Swedish pulp and paper industry and chloralkali process. Chemosphere 20, 7001. 1990.